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The commencement of another half yearly volume gives us the privilege which we assume only on such occasions of speaking of ourselves,—our labors for the time that is past, and our hopes and fears for the future. In doing this, we shall speak in plain terms, and relying upon the good sense of our subscribers, we trust we shall not be accused of egotism.

At the commencement of the past volume, our readers will remember that our Journal was much behind its regular time of publication. The cause of this delay was solely *want of means*. Matter was not, and never is wanting,—but without money, we can never get on,—paper must be purchased,—the printing must be paid for, and last, but not least, is our rent. If we were behindhand in fulfilling our engagements, our subscribers were still more so; if we had not wherewithal to pay the actual expenses of publication, to say nothing of recompense for our own labor, how could we be expected punctually to perform our appointed duty. In the face of all this discouragement, we made the effort, and by the punctuality of *some* of our subscribers, we made the effort to satisfy *all*. The volume has been completed, and the latter numbers appearing at the proper time, we are able punctually to commence the new volume. It will be seen on reference to the pages of the volume completed, that nearly one half is composed of new and original, and we hope, interesting matter. It must be recollected that the information thus embodied, is prepared at no small cost of time and labor, and contains, generally speaking, the result of experience

and intelligence collected from various quarters, and not to be obtained elsewhere.

We have thus, in good faith, endeavored to fulfill our portion of the contract between ourselves and subscribers;—it only remains for them *punctually* and *fully* to fulfil theirs—which is *to pay us five dollars yearly, in advance*, and as those who have neglected to pay for one, two or three years past, can no longer pay in advance for what they are in arrears, we shall be perfectly satisfied upon receiving their past dues in full and the advance for the new volume. If our journal is the means of doing any good in the cause for which we have so long labored, *it must be supported*, if not, we must withdraw from the field, and when the prospect is improving, suffer the mortification of seeing others reap the fruit of our labors. We confess that such complaints are unpleasant, but they are quite as much so to us as to others. Much as we desire the gratification of forwarding the cause of internal improvement, we have duties to ourselves and others, which are imperative and *must* be fulfilled.

But while we are *bound* to make known our disappointments and complaints, we are equally bound to express our deep feelings of obligation to those of our friends, who, not only have punctually paid their dues, but have also given us their advice and assistance. To those gentlemen who have been so kind as to contribute their share to our pages, we are happy in being able to tender publicly our hearty thanks and expressions of regard. To those personal friends, who have ever been present with counsel and assistance, we owe this acknowledgement of their labors, which have been called forth by their earnest and disinterested attachment to the cause, rather than by any merit of our own.

TO THE MEMBERS OF THE PROFESSION OF CIVIL ENGINEERS THROUGHOUT THE UNITED STATES, we beg leave to address a few remarks:

Up to this time there has been no organization of the profession, and from the infancy of the railroad cause, our journal has been the only means of inter-communication in existence, and although not accredited as such, it has nevertheless been regarded by many in that light. Whether we have entirely satisfied their expectations, is for them to determine. If we have ever failed, it has been rather from the want of *means* than of *will*.

The present period is remarkable for the intense interest excited in the public mind, upon the subjects with which we deal, and the desire for, and want of correct and authentic information, is universal. Our country is yet young and growing, and many generations must elapse before the absolute necessity for great public works

shall have permitted the equilibrium between the demand and the supply to be reached. In this state of things, the reputation and well-being of the profession is in its own hands, and in proportion to the exertion will be the reward. To supply the demand for information is the first object to be attained. Many points of practice, peculiar in their relations to our own country, have remained undiscovered. Many of the data upon which future labors must be built, are yet undetermined or even unknown. The subject of construction peculiar to our public works, may profitably receive much attention. The nature and preparation of materials—the effects of climate, both destructive and preservative, need far more observation and experiment before the best effects are produced. The economical relations of lines of travel, and the character of the means of transport, embracing generally—the “laws of trade,” particularly—the subject of fares, of public accommodation, of management, and of the force and capacity of the motive power—have already been discussed, but yet are by no means fully determined; and the united labors of the profession are required, to give the light that is needed upon these and the other topics mentioned.

We therefore call upon Civil Engineers generally, and, as members of a common society, to contribute each in his own line, the results of observation, experience or reflection, not only upon a few, but upon all branches of their duties. And in doing so, we desire them to consider the American Railroad Journal as their organ for communication and discussion with each other, and their representative and advocate, with the public in general. In making this request, we candidly admit, that we are alike desirous of advancing their interests and our own, and if any claim is to be urged for the privilege of performing services, the benefits of which are intended to be mutual, we rest that claim upon the long and unremitting exertions of the oldest railway journal in existence, either here or in Europe.

In making these remarks, we trust that our candour will be taken as a measure of our sincerity, and returned by our subscribers with a promptness, which we in like manner will consider as an evidence of their good will, and in proportion to which, will be the exertions and cost which we are prepared to expend upon our journal.

The receipt of the pamphlet of Mr. Ellet on the railroads of the United States, has rendered it necessary that an immediate notice should be made. We are sorry that in this instance we can by no means admit the general correctness of Mr. Ellet's reasoning, however appli-

cable it may have been in a few instances which have passed under his observation. The investigation into the history of railroads in our country, particularly with reference to the causes of failure in some cases, is not to be disposed of in a hasty manner, and unless great care be used in the selection of information, more harm than good might be done. At some other time we propose going at length into this subject, and owing to the kindness of a friend, well versed in these matters, we are able to give a notice of Mr. Ellet's pamphlet, which contains a view of the subject nearly in accordance with our own.

[For the American Railroad Journal and Mechanics' Magazine.]

EXPOSITION OF THE CAUSES WHICH HAS CONDUCTED TO THE FAILURE OF MANY RAILROADS IN THE UNITED STATES.—By CHARLES ELLET, JR., Civil Engineer.

The above is the title of a pamphlet lately put into our hands, the author of which, is already well known by his treatise on the Laws of Trade. The subject as expressed in this title is so much of a puzzle, that to unravel it fully, would take too much time and labor, and we shall therefore limit our notice of Mr. Ellet's attempt principally in expressing our dissent, in a general way, from his main position, which may be expressed by the following quotations:

"If railroads do not maintain themselves, it is not because they are railroads, but because *great* railroads have been contracted where *little* ones only were required."

"I propose to place large roads and strong roads and easy grades and powerful engines *where there is a trade* to justify the necessary expenditure. But to make the provision in all cases commensurate with the duties to be performed—the trade and travel to be accommodated."

"It should therefore be the business of every company, first, to ascertain the trade and travel on the line where it is proposed to operate, but self-evident as it may appear, I am sustained by the history of our improvements in asserting, *that it has never yet been observed.*"

"I put it to *one hundred* railways which are now lingering out a sickly existence, to say, under the light that experience has afforded them, whether the adoption of these recommendations would not have been their better policy."

First then, as to the real number and extent of lines which can legitimately be admitted into the category of railways. But indeed for the researches of a distinguished foreign engineer, the late Mr. de Gerstner, we should perhaps till now have been without any just idea

at all of the number and character of this description of improvement in our wide spread country. After enumerating large and small, main-stem and lateral of every kind, as well in use as in progress, and in contemplation, he makes a sum total of 181. In all new inventions it is common and only fair to allow a per centage for such as must inevitably be spoiled in the making; if therefore we strike off from this enumeration a portion on this account, and another for those which have never even been begun, or are otherwise utterly insignificant in such an issue as this—we may easily reduce the number worthy of any consideration to 80. The proportion again of these that are utterly unproductive, is very few, neither are those many that have been partly paralysed, from inefficient management and a reckless competition, including some others that are only now convalescent from early bad nursing, and the growing pains of youth; but putting all these at 20, there are still left 60 railways which are in themselves eminently successful, and fully corroborative of their original principle of construction having been the right one, but which had been unfortunately overlaid in its infancy, by the collusive ignorance and selfishness in those days, of the three culprits named by Mr. Ellet,—the “engineer,” the “president,” and the “leading stockholder,” to which list might be added a fourth, the “public”—whose rapacity in exactions for the right of way, then often dealt the fatal blow, when anything by accident had been spared from the cupidity of the other three: To speak of 200 railways in the United States, is, therefore, far too sweeping,—and equally so of 100 of them being failures,—which is entirely disproved, by the fact of the successful practical operation of the 60 railways just alluded to, and of double that number in England, from which ours are indeed *imitated*,—and further shows the accusation of utter recklessness conveyed in our third quotation from Mr. Ellet, to be as unfounded as it is little complimentary to the good sense of this enterprizing portion of our citizens.

It is now only a truism, to say, that the most active springs of prosperity in a community, are its facilities of intercourse, and these it has been more particularly of late, an anxious object among every people almost, to extend and improve. The degree of such improvement is of course tested, by how much cheaper, and as the *principal item* in the estimate of that cheapness, at how much *less loss of time* comparatively, it exceeds the best in actual use. It was thought the turnpike, and afterwards the Macadamized road, over which the stage coach was passed at 8 to 10 miles per hour by horse power, were great strides in land travel. On the water, however, steam

Causes of Failure of many Railroads.

power had been for sometime successfully introduced, (thanks to our immortal Fulton,) and thence arose the idea, and the stimulus given to an invention by which it could, with at least, equal success, be applied to land carriages. Railways had existed for a long time as an old invention in the collieries of England, to give more efficiency both to the power of man and horse,—the greatest known in those days,—and in their then incipient state, much economy resulted from them; but this was not enough, and it came to pass, that within the last few years,—and the honor may be divided between the free and restless energies of England and America,—that the locomotive was invented, and which, after successive improvements, and a truer adaptation to it of the old improvement of the railway, have now come to form together *an improvement* which has attained that degree of perfection, that with profit to its projectors, enables it to supercede all others, whose purpose may be transportation of whatever kind. To secure all this, great expense was necessarily incurred, and although the trade and travel actually existing, should be some rule for such outlay, yet the nature of this improvement carried in it, an unavoidable and large *surplus of power*, which rendered the business to be created thereby, a principal consideration in risking its construction; and the result in almost every case, has fully confirmed the justness of such an anticipation.

It is therefore that the accommodating this improvement *exactly* to the present immediate wants of the community, would be neither wise nor practicable, as most of the roads in Mr. Ellet's scale would be only to retrograde, such for instance as were only to cost \$12 to \$1500 per mile, with locomotives at \$500 to match, on which according to our estimate, there could not be furnished as quick despatch and as good accommodation in the long run, as from the old turnpike with good horses.

An instance where a *great* road instead of a *little* one, or rather *none at all*, would have answered better, is the case of the New York and Harlem, which, for 20 miles of single track, mostly plate rail, now costs its proprietors \$83,000 per mile, and is still accumulating, which is not, however, attributable to an original defect in the principle of construction, but altogether to improvident management. An instance of another kind, is the road from Jersey City to New Brunswick, of 37 miles, of single track edge rail, which costs, with an equipment equal to all the traffic and travel between New York and Philadelphia, \$52,000 per mile, including the heavy item of \$10,000 per mile for the right of way, and yet yields 6 per cent. nett, on that cost. In this case, its enterprising projectors,

not overlooking entirely the sufficiency of the existing travel and business, depended also on the effect of the *surplus power* which constituted so large a part of their outlay, and that they built on no fallacy in its producing a full return, it may be stated that the Newark travel alone, which was only 30,000 per annum by stage coaches, has, since the introduction of the railway in the last four years, increased to upwards of 300,000 per annum. In this costly item consists the vitality or creative principle of the railway, and necessary at first to secure the existing business, it is equally indispensable afterwards to provide for its future development. It admits of scarcely any medium, and is a *sine qua non* when determining on the adoption of this improvement.

Still another comparison may be made between the Schuylkill canal, which costs \$38,000 per mile of itself without boats, and the Philadelphia and Pottsville railway, which costs \$50,000 per mile, including cars and motive power. Is it not this additional cost which makes it the superior and cheaper work of the two? And here again its projectors, with an eye at first towards appropriating the present large trade on its line, have, in this apparent great cost, provided a reserve of power equal to the management of double that trade or more, which will be gradually accumulating upon it by its own creative principle. It is now indeed allowed, that much of the suffering and failure with many important railways, has proceeded from too cheap a construction at first.

The modifying scale required by Mr. Ellet's plan may be applicable to the steamboat from its transferrable character, but not to the railway, which, as a fixture, must look alike to the present and the future; and the adoption of his plan, it would seem to us, instead of being consistent with the *rapid progress* and universalizing process required by the "onward" character of the age, would return us to the era prior even to the stage coach. We consider that the steamboat and railway, but particularly the latter, as the most reaching, have saved our Union, and are destined to knit us still closer. All this has been done at an immense private pecuniary sacrifice, which the General Government, the appointed guardians of the people's welfare, have only just now been willing to admit: we refer to the late reports of the Secretary of War and the Postmaster General, whose recommendations (sometime since first broached in this Journal) we trust may not go unheeded by the people's representatives to whom they are addressed.

We have thus endeavored to show that the *great* objects and purposes of the railway have been misconceived by Mr. Ellet; and so

readily does error, as regards this improvement in particular, fasten itself on the public mind, that the few sentinels on its watch towers are required to be doubly on the *qui vive* to stop its passage, although so much has already been done in this way, that for all future purposes, it may be proclaimed in the ascendant, as constructed on the principle which has till now obtained; and so great have been of late the modifications in the details of construction, that a much improved structure can now be built *far cheaper* than was practicable some few years ago.

By the following report, it will be perceived that the Susquehanna division of the New York and Erie railroad is in a state of forwardness as gratifying as it is unexpected. Until reading Mr. Stuart's report, we had no conception of the rapidity with which this portion of the work—in itself a long railroad—had been advanced. Great credit is due to Mr. Stuart for his energy in pressing on the construction in an interior country, where the means for accomplishing transport and obtaining aid are not always under control.

This section has a feature as novel as it is likely to prove useful. We refer to the construction of *seventy-four* miles out of 117½, of piled road, entirely by the aid of steam pile drivers, at the moderate cost of two thousand dollars per mile, including the cost of the timber. Dependant upon this mode of construction is the great advantage that, according to the convenience and means of the company, this piling may be filled in with embankment, at a cost far less than would be required by the usual method.

We likewise note with pleasure and hail as an evidence of the approach of a just appreciation of the merits of railways in the public mind, the fact that nearly *two hundred acres* of land have been given to the company by owners in the different villages, to be used for depots and station houses. With this liberality on the part of proprietors, we doubt not will be found a disposition in others parts of the route to bestow land, both for similar purposes and for the road itself.

There is no reason why this whole section should not be finished early in the coming season, and by next fall pour down upon us the produce of this vast region, to the mutual profit of the producers, the consumers and the company, whose enterprise has already received such a grateful stimulus in the brilliant success of the portion of the road completed to Goshen.

NEW YORK AND ERIE RAILROAD.—REPORT OF THE CHIEF ENGINEER
OF THE SUSQUEHANNA DIVISION, TO THE STATE INSPECTOR.

ENGINEER'S OFFICE, SUSQUEHANNA DIVISION,
ELMIRA, December 8, 1841.

DEAR SIR: In compliance with your request, of the 4th inst., I herewith transmit you a brief report of the state and progress of the work on the Susquehanna division of the New York and Erie railroad up to the first of this month; together with an estimate of the further expenditures, necessary for its completion:

I. Work done.

Six miles graded for graded road bed.

Thirth-five miles graded for piled road, before piles are driven, for the purpose of bringing the earth material to within two and three feet of the graded line.

Seventy-four miles of piles driven, sawed off and peeled, including the pilling, through about thirty miles, and one-half of the above grading for piled road.

Six and one-half miles of superstructure, exclusive of the iron H rail.

Six miles of iron rail delivered at Corning.

Ten bridges completed and painted, including one large bridge over the Chemung river, at Corning, one over the Conhocton, at Painted Post, and three over the Chemung canal and feeder.

The foundations for *fourteen* bridges completed in readiness for the superstructure, including the abutments, piers and ice-breakers, for *three* of the larger class of bridges on the Chemung river, and *five* on the Canisteo.

The foundation for *twelve* bridges in part, constructed; *four* on the Canisteo river, and *one* on the Chemung.

II. Timber delivered and used in the above work.

2,100,000 lineal feet of piling timber, from 10 to 20 inches in diameter, and from 8 to 30 feet in length.

730,000 feet (b. m.) of ties and rails, for superstructure of road.

15,000 white elm treenails for superstructure.

90,500 lineal feet of square white oak timber, for foundations of bridges.

170,000 feet (b. m.) of white oak, and

180,000 feet (b. m.) of white pine plank, for bridge and culvert foundations.

400,000 feet (b. m.) of white oak and pine timber, for superstructure of bridges.

Total amount of timber delivered and used in the work, is 2,190,500 *lineal feet*, and

1,480,000 feet (b. m.) with *fifteen thousand* white elm treenails, for securing superstructure to the piles.

III. Timber delivered and ready for use.

6,200,000 feet (b. m.) or sixty miles of superstructure timber for road.

500,000 feet (b. m.) of timber for the superstructure of bridges.

250,000 *lineal feet* of piles for piled road.

50,000 *lineal feet* of square oak timber for bridge foundations.

100,000 feet (b. m.) of white oak and pine plank, for bridge foundations.

70,000 feet (b. m.) of timber for the foundation of trestle bridges.

30,000 white elm treenails for superstructure of road.

Total amount of timber delivered ready for use is 300,000 *lineal feet*, and 6,870,000 feet (b. m.) with 30,000 white elm treenails, for superstructure.

The estimated cost (exclusive of an iron rail,) to complete the Susquehanna division is as follows, viz :

From Hornelsville to Elmira, 59.85 miles,	-	\$200,000
" Elmira to Tioga Point 18 "	-	140,000
" Tioga Point to Owego, 18 "	-	25,000
" Owego to Binghamton, 21.65 "	-	85,000
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Total,	117.50 miles,	\$450,000

The additional cost of an iron H rail, weighing 56lbs. per yard, with the necessary castings and spikes to secure it, is estimated at \$7,000 per mile, including the expense of transportation, and the workmanship requisite to place it upon the superstructure.

The right of way is obtained for a distance of about *one hundred and five miles* upon this division, of which amount, *sixty-two miles* have been deeded ; embracing *six hundred and seventy acres of land*, *four hundred and twenty farm crossings*, and *forty thousand rods of fencing*. The residue is re-leased, by written agreement, but the deeds have not yet been executed.

All the timber required to complete the *piling, bridging* and *superstructure* upon this division, is under contract to be furnished before the first day of June next, and the greater portion by the first of April.

The eight steam pile drivers that have been in operation during

the past season on this division have suspended work for the winter. If they resume as late as the first of April next, they will be able to drive the remaining thirty-four miles of piled road by the first of July, 1842. Only two miles of light grading for graded road, yet remains to be done, and three and one-half miles of grading for the piled road, before the piles are driven. Sixty miles of the distance piled, will not require embanking while the piles remain sound, the grade being less than three feet above the surface of the ground. The residue of the grading necessary for the piled road will be done with cars after the superstructure is laid, at a much less expense than it could be done previously by wagons or carts.

The amount of high piling and heavy embankment is greatly increased by the necessity of keeping the grades, (where the road bed occupies the bottom lands) above the river freshets; and placing the bridges over the Chemung and Canisteo rivers out of danger from the highest floods.

The road bed between Elmira and Hornelsville is prepared for the superstructure, with the exception of two miles of light grading, and about nine miles of piling. Six miles of the superstructure is laid.

From Tioga Point to Owego, the grading and piling is now completed, and the superstructure timber nearly all delivered. This superstructure is now being laid.

From Elmira to Tioga Point, and between Owego and Binghamton villages, a large proportion of the grading and piling is also completed.

The working force that has been employed during the past season, can, if the necessary funds are provided in time, finish the entire division by July 4th, 1842.

Indeed, the Susquehanna division may now be considered, at least, *two thirds* constructed, (exclusive of the cost of the iron rails) and the timber, necessary for its completion, is now more than *three fourths* delivered and paid for.

The total amount expended since the commencement of this division is less than eight hundred thousand dollars. Thus you will see that this sum includes the amount expended for the "*right of way*" for *one hundred and five miles*,—for *four hundred farm crossings*,—and *forty thousand rods* of fencing,—the grading and preparing for the superstructure, of over *eighty miles of road*,—including several miles of heavy grading, and protection river wall along the abrupt shores and narrows of the Susquehanna, the

Chemung and the Canisteo rivers,—and the construction of several large bridges over the two latter streams, including expensive foundations and ice-breakers, and numerous other bridges over smaller streams. Also, six miles of superstructure is laid, and the iron delivered for it, together with the timber requisite to lay over *sixty miles* additional track, and for some *fifteen* bridges of the larger class, to be constructed over the Chemung and Canisteo rivers, also, the timber necessary for *ten miles* of piled road—altogether, showing a result truly surprising, and entirely unprecedented in the annals of railroad construction in this or any other country. Of this distance, *seventy four miles of piled road* has been constructed at a cost not exceeding *two thousand dollars* per mile, including the necessary *white oak* piling timber. To have graded this same distance, by excavations and embankments for a graded road bed, with the necessary culverts and side ditches, would have required an additional sum of not less than *two hundred thousand dollars*.

Suitable grounds for passenger and freight depots have been donated to the company, by the owners of landed property in the several villages through which the road passes on this division, to the amount of nearly *two hundred acres*, varying in quantity from three to thirty acres for each depot—the estimate value of which, is from *one hundred to one thousand* dollars per acre.

It is proposed to have the materials required to construct the depot buildings on this division, delivered during the present season, and the buildings completed in July, 1842.

Respectfully submitted,

C. B. STUART.

Chief Engineer Susquehanna Division, N. Y. & E. R. R.

To CHARLES ADAMS, Esq., *State Inspector,*

THE POSTMASTER GENERAL AND THE RAILROADS.

The report of the present Postmaster General comes to us promising better things than did that of his predecessor. In the document before us, from which we give extracts, we perceive tokens of a more liberal and enlightened policy than has hitherto prevailed. One of the chief causes of the difficulties between the Department and the railroads, is here fairly set forth—we mean the inability to reconcile the wants of the Post Office and the travelling public, as to times of starting. From the moderate tone of this public officer, and the promptness with which his overtures appear to have been met, we have reason to hope that these long desired arrangements may before long be completed.

Much attention has been excited by a proposal or suggestion in this document, and which promises to have a powerful influence upon railroads. The Postmaster General proposes to advance the credit of the United States to an amount, which, at 5 per cent., would produce an interest equal to the present annual compensation. By this means a provision will be made for the future control over the transportation of the mail, and a valuable previous consideration will be realized by the companies contracting.

This plan which has, as far as we have noticed, received general approbation, was some time since produced in this journal as a means for settling all difficulties and doing a public good. We see nothing in it at all objectionable, and we hope that Congress will think favorably of it and carry it into effect.

"The act 1838 declares that 'each railroad within the limits of the United States, which now is, or hereafter may be completed, shall be a post road;' and in that law, and the act of 1839, provisions limiting the amount beyond which the Postmaster General is prohibited from paying for the transportation of the mail on railroads will be found.

"Great embarrassments to the Department have arisen in the making of contracts for the transportation of the mail with many of the railroad companies, under the laws now in force. These embarrassments arise mainly from two causes; the one, that the price which the Department is enabled to pay, whether in reference to its means or the maximum fixed by the legislation of Congress, has been deemed inadequate by many of the principal companies. The other arises from an unwillingness on the part of some of the companies to run by a schedule prescribed by the Department; preferring to run at such times as will best suit the travel upon the road; regarding, as it is natural for them to do, the carrying of the mail as secondary to the transportation of passengers. The latter evil has been particularly felt in the great southern mail, on its transit from Washington city to New York. The mail going south from New York, is necessarily thrown upon the Philadelphia and Baltimore railroad in the night, between Philadelphia and Baltimore; and the southern mail for New York is compelled to lie over twelve hours in Baltimore, unless the Philadelphia company can be induced to run that trip also in the night. This they have declined doing, unless the Department would pay them a compensation greater than is authorized by the laws of Congress. Under a hope that some arrangements could be made—to last during the session of Congress, if no longer—I addressed to the presidents of the railroad companies concerned in the transportation of the mail between the city of Washington and New York a letter, a copy of which, and the report of the First Assistant Postmaster General upon this subject, are herewith submitted.

"An anxious desire to effect some permanent arrangement with the railroad companies for the transportation of the mail, upon a basis

which shall be both just and uniform, considering the nature of the service performed by each, induced me to invite a meeting of the presidents of the different companies, in the city of Washington, on the first of January next; and I am gratified at the prompt manner to which all who have been heard from have consented to attend, and a hope is cherished that some arrangement, satisfactory to all parties and beneficial to the public, may yet be effected.

"The improved mode of intercommunication by railroad and steam, operating under chartered rights granted by the States, and over which it is not pretended that the General Government, much less the Post Office Department, can exercise any control, imposes upon Congress, in my opinion, new duties and obligations, which can only be cancelled by the adoption of some measure whereby the Post Office Department may, upon adequate consideration, secure by compact the right to transport the mail in the cars of railroad companies, and at the same time give to the Department the power to control the departure and arrival of the same.

"There is now paid to the different railroad companies, annually, over \$400,000 for the service, without power in the Department to regulate the travel, arrival, and departure of the mail; and constant and frequent difficulties, both in entering into and the execution of contracts, are presented.

"It has occurred to me that the present was a most favorable period for the adoption of some measure by Congress, whereby to secure to the United States the right to transport the mail upon these roads in all time to come, free of any annual charge upon the Post Office Department, by the advancement of a sum in gross, which may be agreed upon, to each of these companies, or such of them as may be willing to contract. Many of the railroad companies, and some of them constituting most important links in the great chain of intercommunication between Boston and Charleston, owing to the great derangement of the monetary concerns of the world, and the depression of all State and company stocks, find themselves laboring under embarrassments and difficulties, which the aid of the General Government, applied in the way proposed, would effectually remove, and at the same time secure to the United States the advantage and the ample equivalent of transporting the mail upon these roads.

"The credit of the United States to an amount not greater than the sum necessary to produce, at five per cent. interest, the amount paid by the Post Office Department to these companies annually, would, I have no doubt, be sufficient to accomplish this desirable end. The prompt and favorable action of Congress upon this subject at the present time, would effectually secure the Government against the danger of being called upon for occasional and large appropriations to meet the balances due by the Department.

"Do I ask the United States to do more for the Post Office Department than justice would seem to demand, especially when it is remembered that the whole expense of the official correspondence of the Government and the public, and private correspondence of those entitled by law to the franking privilege, is sustained and paid

by a tax upon the correspondence of the community? If by this arrangement the Department is relieved from the heavy annual charge as now rated, (and it has neither the power to lessen it nor to prevent its increase,) it may be hoped that the object so much demanded by considerations of public justice (that of reducing the tax upon the friendly and business correspondence of individuals will be attained,) and, at the same time, the usefulness of the public mail greatly enlarged and extended to those portions of the Union hitherto measurably denied the necessary mail facilities.

"If the Government was required to pay postage upon official correspondence, and if the franking privilege was abolished or reduced to proper limits, the revenue of the Department would be increased to an amount sufficient of itself to pay the interest upon the debt to be incurred by the proposed arrangement, and liquidate the principal in less than thirty years.

"I respectfully submit to the President the propriety of communicating to Congress the views which I entertain and have here expressed upon this subject."

[From the Civil Engineer and Architect's Journal.]

HISTORICAL SKETCH ON THE USE OF BRONZE IN WORKS OF ART.

By CESAR DALY, Architect.

The exertions of the Italian artists excited general emulation throughout Europe; and in a very short time every country used bronze for the decoration of its public edifices, and to transmit to posterity the deeds of its kings and great captains. Italy erected statues to the Medici and the Farnese, Spain to Philip III., Russia to Peter the Great, Sweden to Gustavus Adolphus, and England to Charles the First. Much might be said with regard to the progress of this art, but we consider ourselves obliged on account of the extent of the subject to limit it to the history of bronze in France.

It was under Louis 14th, that this art made rapid progress through the enlightened endeavors of the two brothers Keller, whose principal master pieces are yet to be seen adorning the royal palaces of Versailles and the Tuilleries. In 1699, Balthazar Keller cast in one piece the equestrian statue of Louis 14th, modelled by Girardon. This colossal mass was more than seven yards high, and yet weighed only 26,072 kil. (57,50 lb.) It seemed, however, as if the art of founding had only attained this state of perfection soon to fall into decadence; the equestrian statue of Louis 15th, cast by Gor in one piece, from the model of Bouchardon, and afterwards raised in the Place de la Concorde, was only 5.40 m. (17 ft. 9 in.) in height, while its weight was 29,370 kil. (64,775 lb.) During the revolutionary crisis, the only bronze work was limited to cannon; but under the Empire, bronze was again appealed to, to take its place among the other arts in representing the military triumphs of the French. Unfortunately the art had been too long neglected to allow of success, and some of the first essays were not prosperous, the statue of Desaix was a complete failure, and the Column of the Place Vendome is far from being a masterpiece of founding.

According to M. Payen, to whom we are indebted for the following details, the execution of the Desaix statue was put up to contract, and it was undertaken for 100,000f. (£4,000,) a price in which the bronze was not included. The contractor gave up his bargain to a bell-founder, and he knowing nothing of the fashioning of such great works, and calculating upon the basis of his ordinary limited operations, engaged to do it for 20,000f. (£800;) but in order to economize as much as possible, he required that the sculptor should be forbidden from superintending the moulding. The most difficult hollows were filled up, in order to avoid the trouble they would occasion; an attempt was made to mould in sand with frames, furnaces were erected, and an ill-constructed scaffolding, and after many useless arrangements and expenses, the bronze was let out, and having burst the moulds, ran about. Thus the operation completely failed, a good deal of the bronze was lost, and it was necessary to begin again. The founder then tried to cast the monument in pieces, but not arranging his moulds well, nor securing a uniform mixture of the metal, the pieces produced were dissimilar. He managed however, to fit them together, but all the proportions of the figure were altered, and as these defects could not be remedied by the chisel, a most wretched monument was produced.

When the column in the Place Vendôme was erected, the same faults were repeated; a bargain was made with an iron founder, who had never been engaged in bronze work, he however, had the temerity to undertake the moulding and finishing at one franc per kilo. (9d. per 2 lb.) The government on the other side, undertook to deliver to him in guns, taken from the Russians and Austrians during the campaign of 1805, the quantity of bronze necessary for the completion of this enormous monument. The founder used a furnace he had for casting iron, but not being aware of the phenomena of bronze casting, and urged by his vanity to attempt in the first instance the casting of several of the great pieces of the base of the column, he encountered several defeats. Each time he necessarily altered the alloy by oxydizing the tin, lead and zinc, which metals so oxydized passed into the scoræ or were carried off by the current of warm air. He did not perceive this cause of continual loss, and continued to produce the bas reliefs; but it may be readily conceived that they contained more copper than the bronze of the guns. When the founder had got two thirds through the column, he found out that he had got no more metal, and being, according to contract, responsible for the metal delivered to him, he was at once ruined. In this lamentable situation he tried to melt up the white metal obtained from the reduction of the scoræ and a large quantity of refuse metal which he had bought up at a low price. The bas reliefs which he obtained from the mixture of all these materials were marked with blotches and lead spots, their color from a dirty grey became quite black: the authorities refused to receive work so defective, and put his foundry under sequestration. He succeeded, after much petitioning, in obtaining a committee to examine his accounts, which was composed of two chemists, two architects, two mechanical engineers, and two founders,

with an auditor of the Council of State for the chairman. The weight of each piece delivered by the founder was known; specimens were taken from them, and the proportional parts weighed, from which was made an ingot representing the mean composition of the whole column. It was then found by analysis that it contained :

Copper,	-	-	-	-	-	-	-	-	89.440
Tin,	-	-	-	-	-	-	-	-	7.200
Lead,	-	-	-	-	-	-	-	-	3.313
Silver, zinc, iron,	-	-	-	-	-	-	-	-	0.047

100

The committee then took specimens of bronze from the guns remaining in the government stores, and an ingot was formed to represent as nearly as possible the mean composition. The analysis of this ingot gave the following proportions :

Copper,	-	-	-	-	-	-	-	-	89.360
Tin,	-	-	-	-	-	-	-	-	10.040
Lead,	-	-	-	-	-	-	-	-	0.102
Silver, zinc, iron, loss,	-	-	-	-	-	-	-	-	0.498

100

It was further known, that the law in France had fixed the composition of gun metal at 90 parts of copper and 10 of tin per cwt., but that this law was never well executed and during the revolution scarcely attended to it at all; it was also known that these foreign guns were of a more complicated and baser alloy than the French. Taking all these circumstances into consideration the committee were of opinion that the founder had produced an alloy, if not superior, at least equal, to that which had been given to him; and that he could not be charged with fraud in his contract. The chemical operations further explained the whole proceeding; by making separate analysis of the specimens of the great bas reliefs, the shaft, and the capital, it was found that the first had only 0.06 alloy per quintal; the second, particularly towards the upper part, and the third contained as much as 0.21. It was therefore evident that the founder not knowing how to manage bronze, had refined his alloy by several times re-melting, and consequently diminished the total weight, and that to make up for this loss, he was obliged to put into the last castings the white metal extracted from the scorix. Thus he had given bronze of too good alloy in the beginning, which had obliged him at last to make the alloy too low. The moulding of the several bas reliefs was so badly executed, that the chaser employed to go over them, removed by chiselling or filing, a weight of bronze equal to 70,000 kilo. (7 tons,) which were given to him, besides a sum of 300,000f. (£12,000) paid down.

It was certainly hard to pay so dearly for experience, but fortunately it was profitable; not, however, that all the subsequent bronze works in France have been more successful, for the founders had to

submit to several severe checks, and were obliged to study the processes and proportions necessary to form a good alloy.— Thus when in 1817, Lemot was employed to cast the equestrian statue of Henry 4th, now on the Pont Neuf, he at least took the precaution to take specimens from three bronze statues of Keller at Versailles, which were the best, with regard to casting, green color, and the grain. The following is the result of his analysis:

	No. 1.	2	3	Mean.
Copper, -	91.3	91.68	91.22	91.4
Tin, -	1.	2.32	1.78	1.7
Zinc, -	6.09	4.93	5.57	5.53
Lead, -	1.61	1.07	1.43	1.37
	100	100	100	100

Lemot thought that he had gained experience enough from these analysis, but he did not escape from serious difficulties during the casting. Wishing to make use of the furnace, which had been built for casting the equestrian statue of Louis 15th, formerly in the Place de la Concorde, but the furnace not having sufficient draught for the fusion of Keller's alloy, in which there was more copper than in that of the statue of Louis 15th, he was obliged after several trials to make great changes, and still the casting did not perfectly succeed. The body of the king had several hollows in it, and the belly of the horse failed, a hole so large having been formed that it was obliged to be filled up; further 14,000 kilo. (14 tons) of oxydized rubbish was sold off.

Casting in bronze, although presenting only slight difficulties in the manufacture of objects of small dimensions, has always required greater responsibility when it is required to form considerable masses, perfectly homogeneous. The component metals are deficient in energetic affinity for each other, when in fusion tend to separate in the order of their densities, and when the less fusible begin to solidify, the others in a liquid state, rise up towards the top, where the easy oxydation of a component part of the alloy always causes the risk of refining the metal. Besides these great obstacles, others are encountered in calculating the several component parts of the bronze, where it is wished to obtain precisely the required quantity of metal for the object to be cast, also in the preparation of the model, the construction of the furnace, and the dispositions of the moulds. These and other difficulties explain how many abortive attempts sometimes preceded in former days the casting of a large work in bronze. They point out why Falconet was 15 years casting the equestrian statue of Peter the Great, which figures on an immense monolithic pedestal at St. Petersburg; why the Keller's were 9 years casting the statue of Louis the 14th; why Bouchardon and his successor Pigalle took 8 years for that of Louis 15th, on the Place de la Concorde; why the statue of Desaix, and we may almost say the column of the Place Vendome, failed, and why the great equestrian statues we have mentioned did not come perfect out

of their moulds. The statue of Peter the Great was obliged to be begun again from the knees of the Czar and the breast of the horse, to the top of the statue. Bouchardon had much trouble in restoring the delicate forms of the horse in his beautiful equestrian statue of Louis 15th, which were badly produced in the lower part, and we have related the difficulties encountered by Lemot and Piggiani in casting the statue of Henry the 4th, difficulties which lasted four years. We cannot better finish this essay than by mentioning those which have just been surmounted in casting the various parts of the July Column, and for the better effecting this we shall compare it with the column of the Place Vendome, which is the only one having any analogy to it. The Vendome Column is only coated with bronze, and the largest pieces are only five yards in extent, while each of its tambours is composed of six pieces, and the whole cost of the column in specie and metal provided by the State was two millions (£80,000.) The July Column on the other hand is entirely of bronze, and each tambour is in one piece, the base of the column extends about 16 yards, and the capital at the most extended place has the enormous dimension of 26 metres, 85 feet. This column, however, only cost 1,172,000 francs (£46,880.)

Inequalities in the thickness of the parts constitute one of the great difficulties of casting, because the thin parts cooling rapidly, and the thick parts slowly, the shrinking of the former taking place sooner than that of the latter, is apt to split the metal. It may be also conceived that the shrinking of a large object is so much more than that of a small one, as its dimensions are greater and the necessity for taking this into consideration causes a fresh difficulty in the construction of the mould, which must be calculated so as to provide for the contingency. It is easy in the same way to conceive that the least motion of the mould during the operation, will cause the required thickness to be exceeded. These considerations will explain the difficulties which had to be surmounted in casting the several parts of the Column of July, and as to the statue, we cannot do better than republish an abstract from the report of M. Hericarb de Thury, made to the *Societe d'Encouragement*, on the improvements introduced by M. Soyez in the moulding of bronze sculptures.

"This statue 4.25 m. (14 feet) in height, supported on the toe, and bending forward, presented great difficulties in the moulding, and still greater in the casting, as the solidity of the statue depended on the extreme lightness of the upper parts, and the strength of the leg on which it is supported. Had the old methods been resorted to the figure would most probably have failed, or have been tried in several pieces: because the upper part being very thin would cool down immediately, while the lower part cooling more slowly, would have contracted on itself, leaving at the ancles an opening of about 25 millimetres (an inch,) the metal contracting from 12 to 14 millimetres per metre ($\frac{1}{4}$ an inch) and the statue would have undoubtedly been lost. To obviate these difficulties, M. Soyez determined upon casting it head downwards, by which he diminished the danger, I say diminished, for in this posture, the mould must have yielded, or

the leg broken above the ancle. To provide for this, M. Soyez placed on each side of the foot a branch of copper 6.6 met. (26 in.) broad finishing in a strong head, so as to force the foot to contract on the knee. Further, these branches were so managed as to be rather thinner than the leg. Full success crowned the trial of this bold and ingenious innovation, the casting of this admirable statue succeeded in every detail, being perhaps the first time that a figure of this importance was cast without any defect. The thickness of the statue is from 4 to 5 millimetres (a sixth to a fifth of an inch,) in the upper part, except the wings, which are only two millimetres. The supporting leg is 55 millimetres ($2\frac{1}{4}$ inches) thick, beginning from the ancle, and progressively diminishes in thickness up to the thigh."

The monument of July undoubtedly marks a new era in the history of the art of bronze casting, and places France in the first rank in its pursuit, and in order to do justice to M. Soyez, we must mention some of the improvements effected by him. This artist has got rid of the use of iron as a means of consolidating isolated parts of figures, and particularly in supporting members; he casts these parts full by turning the figure upside down, which is an important innovation. He gets over the resistance of the sand of the mould on the contraction of the metal, not only by the weight of the mould, but by the progressive tenacity of the bronze while cooling. This tenacity, which may be considered as proportional to the area of the section of the part so cast, is increased at pleasure by accessory parts placed in the mould according as they are wanted. It is thus that the Genius of Liberty was cast, having as it were a second shapeless leg placed parallel to that which supports the figure, and intended to become at the period of contraction, auxiliary to the statuary leg to which it was united by the two extremities. Thus also was cast the bent back leg of the horse of Charles Emmanuel of Savoy. In order to prevent this leg from breaking in the ham when cooling, the foot was united to the thigh by a strong tenon, which was afterwards chiselled away.

[From the Civil Engineer and Architect's Journal.]

ENGINEERING WORKS OF THE ANCIENTS.

Carthaginian engineering.—Our author gives an account of several sieges by the Carthaginians in Sicily, who appear from his account to have been as skillful as the Greeks in military warfare. At the siege of Himera in Sicily, Hannibal the elder (Book 13th,) undermined the walls, supporting them with great pieces of timber, which being set on fire, a great part of the walls suddenly fell down.

In the 20th book, in the account of the expedition of Agathocles into Africa, there is a description which mentions the country as well irrigated and supplied with canals and sluices.

Macedonian gold mines.—Philip king of Macedon, (Book 16th,) having taken Crenidas, and called it Philippi, so improved the gold mines in those parts, which before were but inconsiderable and obscure, that by building of houses for the works, he advanced them to bring in a yearly revenue of above a thousand talents.

Alexander the Great.—The siege of Tyre by Alexander the Great recounted in the 16th Book, required the execution of works on a very great scale. Alexander demolished Old Tyre, as it was then called, and with the stones carried by many thousands of men, raised a mole two hundred feet in breadth across the sea, which by the help of the inhabitants of the neighboring cities, who were impressed for the purpose, was speedily carried out a considerable way. This mole was afterwards injured by a violent storm, when Alexander caused it to be repaired with trees laden with earth, and so again brought it near the city. By this and many other operations he was able to take the city, after a gallant defence, in which the inhabitants displayed much ability.

In the memorandum books of Alexander examined after his death, (Book 18th,) were found heads of six colossal plans, among which were the following,—that a plain and easy road should be made straight along the sea coast of Africa to the Pillars of Hercules, that six magnificent temples should be built, and that arsenals and ports should be made in places convenient for the great navy he contemplated. These things, although highly approved by the Macedonians, yet because they seemed things beyond all measure impracticable, were desired to be laid aside.

Inundations.—During the Seleucian war, (Book 19th,) the Macedonians under Eumenes encamped on the banks of the Tigris, about three hundred furlongs from Babylon, Seleucus occupying the river with a flotilla of small vessels. The Seleucians having sailed to an old water course, cut down the banks at a part where it had been filled up from length of time, upon this the Macedonian camp was surrounded with water, and all the tract of ground overflowed, so that the army was in great danger of being utterly lost. At last removing a great part of his army in flat bottomed boats, he caused all the Macedonians to repossess the river, and then for the purpose of recovering his carriages and baggage, by the direction of one of the native inhabitants, he set about cleansing such another like place, by which the water might be easily diverted, and the ground all round about drained dry. When Seleucus perceived this he granted a truce and the works were suspended.

In the same book is the account of the natural inundation, by which the city of Rhodes was so much injured. Rhodes being built in the form of a theatre, and the rain very heavy, the water ran for the most part into one place, and the lower parts of the city were presently filled with water, for the winter being looked upon as over, no care had been taken to cleanse the channels and sewers, and the pipes likewise in the walls were choked up, so that the water stood several feet deep, until part of the city wall breaking down, the pressure was suddenly relieved.

Pilework.—In a mention of the Cimmerian Bosphorus in Book 20th, it is related that the king's palace was surrounded with the river Thasis, and that there was a road to it through the fens, guarded with forts and towers of timber, raised upon pillars over the water.

Demetrius Poliorcetes.—We find in the 20th Book, a long account of the siege of Rhodes by the celebrated Demetrius, who among other works made extensive mines under the city walls, which being told to the Rhodians by a deserter, the Rhodians made a deep trench along the walls, which was now ready to be tumbled down, and forthwith fell to countermining, and at length met the enemy under ground, and so prevented the mine from proceeding any further.

EXTRACTS FROM THE REPORT OF THE SECRETARY OF THE NAVY.

NAVY DEPARTMENT, December 4, 1841.

The steamships *Missouri* and *Mississippi*, built under the act of 3d March, 1839, the former at New York, and the latter at Philadelphia, are nearly ready for service, and will form a part of the home squadron.

Orders have been given for the construction of three steamers of medium size, under the act of 3d March, 1841, one at New York, one at Philadelphia, and one at Norfolk. In addition to these, Captain R. F. Stockton is superintending the construction, at Philadelphia, of a steamer of 600 tons, to be propelled by Ericcson's propeller; and Lieutenant W. W. Hunter is engaged in like manner at Norfolk with one of 300 tons, to be propelled by submerged water-wheels invented by himself. Very valuable results are anticipated from these experiments.

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Experiments in gunnery and projectiles, which have been conducted for several successive seasons, under the direction of Captain M. C. Perry, in the vicinity of New York, have been continued on board the United States steamer *Fulton*, Captain John T. Newton, but under the general control of Captain Perry. In testing a gun in the usual mode, it unfortunately burst, killing several men and wounding others. I have caused the subject to be investigated by a court of inquiry, whose finding shows that, however distressing and deplorable the accident may have been, no just censure can be attached to the officers conducting the experiment.

Measures have been adopted, and are now in process of execution, for supplying the navy with the requisite guns. Less progress has been made than was desirable, because of the great pains which have been taken to obtain the *best* guns which could be procured in the country. In a short time they will be furnished of the various descriptions used in the service, including Paixhan guns.

Under the appropriation of the last session, for the purpose of "making experiments to test the value of improvements in the construction of steamers and other vessels of war, and in other matters connected with the naval service and the national defence," nothing has as yet been actually paid. Some experiments, however, have already been authorized, and others are now under the consideration of the Department, from which very beneficial results are confidently anticipated. It is not proper, however, to make them pub-

lic at this time. So many scientific and practical men throughout the country are now turning their attention to the subject that we may reasonably expect great advantages from a judicious use of this appropriation.

I have, under your directions, taken measures for the construction of a steamer on Lake Erie, in compliance with the act of 9th September, 1841.

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Heretofore we have found in the shallowness of many of our waters, security to a certain extent, against invasion by sea. So long as maritime wars were conducted in vessels of large size and great draught, we had little to apprehend from them except at a few points, and those were susceptible of adequate defence on land. But this security can no longer be relied on. The application of steam power to vessels of war, and the improvements which have recently been made in artillery are destined to change the whole system of maritime war. Steamboats of light draught, and which may be easily transported across the ocean in vessels of a larger class, may invade us at almost any point of our extended coast, may penetrate the interior through our shallow rivers, and thus expose half our country to hostile attacks. The celerity with which these movements could be made, the facility with which such vessels could escape, and the promptness with which they could change the point of attack, would enable an enemy, with a comparatively inconsiderable force, to harrass our whole seaboard, and to carry all the horrors of war into the securest retreats of our people. The effect of these incursions would be terrible every where, but in the southern portion of our country, they might, and probably would be, disastrous in the extreme.

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Of what description of vessels our navy ought to be composed, is a question of great importance, and one which we are compelled to decide with reference to the practice of other countries. Doubtless a very large part of it ought to consist of steamships. Experience has shown that these vessels may be rendered perfectly safe at sea, and that they may be so constructed as to adapt them, in other respects, to purposes of war. Of their great usefulness the world has had a striking proof in the recent operations of the British squadron on the coast of Syria—troops were transported a distance of two thousand miles over the ocean, and were engaged in battle in Asia Minor on the sixteenth day after leaving England. This and other facilities afforded by this class of vessels were so great and effective that the admiral declared that “his success was owing to the efficiency of his steamers.” We may well profit by the lesson thus taught us. I respectfully suggest, however, that it would not be wise in us to engage very extensively in the construction of steam ships of war of the largest class at this time. Imitating the example of England, our wisest policy would be to aid the private enterprise of our citizens in constructing packet ships, to ply

between this country and foreign ports. These should, of course, be so constructed as to fit them for war purposes, and should be held subject to the demand of the Government upon equitable conditions. There will, in all probability, be enough of such vessels to answer all the purposes for which steam ships of the largest class would be furnished at a comparatively small cost to the Government. Improvements are daily made, not only in steam machinery, but in the propelling power applied to steam vessels. Experiments are now in progress which promise important results in these respects, and it would probably be judicious not to expend large sums in the construction of steam ships for distant cruises until these results shall be made known. But the same reasoning does not apply to steam vessels of a smaller class, destined for the defence of our own coast and harbors. These ought not under any circumstances, to be delayed. They would be particularly useful on the lakes and in the Gulf of Mexico. On the lakes they might be advantageously employed, under proper regulations, in the revenue service. They would be peculiarly adapted to the Gulf of Mexico, in consequence of the calms and currents which prevail there, and of their greater facility in making harbor in the violent tempests which are common in that latitude. There is, in truth, but the single harbor of Pensacola in which a ship of large draught can find shelter, although there are many which afford sufficient depth of water for steam vessels of the proper size. These vessels should be built of white oak, reserving the live oak for those of a different class.

Steamships have been built in Europe altogether of iron. As far as the experiment has been made, it is understood to have been successful. I recommend that it be made here also, with at least one vessel of medium size, sufficiently large to afford a fair test, without exposing too much to the hazard of failure. The great abundance of that material found in all parts of our country, affords us every facility which can be desired; and our workman will soon acquire if they do not now possess, the requisite skill in converting it into vessels. We may thus acquire a cheap and almost imperishable naval force, while, at the same time, we afford encouragement to some of the most useful branches of our home industry.

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The propriety of establishing naval schools has frequently been submitted to the consideration of Congress. I again respectfully bring it to your notice, as a subject of increasing interest to the navy. The use of steam vessels in war will render necessary a different order of scientific knowledge from that which has heretofore been required. If our navy should be increased by the addition of any considerable number of steam vessels, engineers will form an important class of naval officers. It will be necessary to assign to them an appropriate rank, and to subject them to all the laws of the service. Great care should be used in the selection of them, because a great deal will depend on their skill and competency; hence it is necessary that they should pass through a prescribed course of instruction, and that the Government should have the proof of their

competency which an examination, conducted under their own rules would afford. This important object can be best attained by the establishment of naval schools provided with all necessary means of uniting practice with theory. The advantages which the army has derived from the academy at West Point afford a sufficient proof that a similar institution for the navy would produce like results.

In connection with this subject, I would ask your attention to the situation of the professors of mathematics now employed in the service. This useful class of men have no permanent connection with the navy, but are called in only as their services are needed, and are not paid except when on actual duty. The consequence is, that they cannot rely on this employment for support, and are often reluctantly driven to other pursuits. It is to be presumed that men whose talents and attainments qualify them to be teachers in the navy, are equally qualified to be teachers on land; and, and, as this latter is the less precarious position, the *best* qualified will be the most apt to seek it. Hence the Department cannot rely with any assurance on being able to command suitable professors at all times when their services may be required. It is, I think of great importance that some provision should be made upon this subject. I also recommend that a certain rank or position be given to the professors, which will relieve them from the necessity of messaging and sleeping with the pupils. This close and constant association is well calculated to weaken the respect and influence which their relation to the young officers ought to inspire, and which is absolutely necessary to give due effect to their instructions. I doubt whether their services upon the present system are worth the money they cost, although they would be highly valuable under proper regulations.

[From the Boston Miscellany of Literature and Fashion.]

GREENOUGH'S STATUE OF WASHINGTON. *By* HON. EDWARD EVERETT.

This statue is a seated figure of heroic, or rather colossal size, being twice the dimensions of life. Were it erect, it would consequently stand about twelve feet high. It represents the great hero, statesman and citizen with the right hand pointed to Heaven, and the left hand holding a sword, with the handle turned from the person. The upper part of the figure is bare; from the middle of the body down it is covered with a senatorial drapery. A very pleasing effect is produced by the manner in which the back of the chair is carved in open work, so as to display the back of the figure. The sides of the chair are wrought in low reliefs, symbolical of the character and fortunes of North and South America; and on the top of the chair, right and left, are figures of Columbus and of a native of our continent. The face is composed from that of Houdon, with a judicious comparison of the other contemporary authorities. It represents all the elevation, benignity and force of Washington's character—his firmness, tempered with pure benevolence; and it possesses an advantage not shared in an equal degree

by that of Chantrey, and still less by that of Canova, in faithfully reproducing the well known features, with which every American claims a personal acquaintance, as of a familiar friend or venerated parent. It will be seen, however, that Mr. Greenough has by no means slavishly copied Houdon. * * * *

This grand work is of one single piece of marble, not of pure white, which it is impossible to procure in masses of sufficient size for such a statue without stains fatal to its beauty, but of a bluish tinge highly favorable to the effect of a work of art. The marbles of this kind are now preferred for works of this description.

There are two points, in reference to which, we have heard Mr. Greenough's Washington criticised, and on which we beg leave to state our impressions. One is the absence of drapery from the upper part of the figure; the other is the precise significance or meaning of the statue, and the propriety of a sitting posture.

The first topic, that of the costume of works of art, is, of course, too extensive to be exhausted on an occasion like this. It presents, undoubtedly, some difficulties. There are two schools among artists in this respect, and two opinions among judges of art. Without engaging in the discussions, we may with safety say, that to confine the sculptor, in a great monumental work like the statue of Washington, to the exact imitation of the clothes and the manner in which the hair was dressed, is greatly to limit the field in which the creative skill of the artist is to be exercised, and to reduce to a low point the standard of the art. It rests upon the false assumption that the closest possible imitation of life is the object of the art of sculpture. It leaves little but the face which would not be purely mechanical imitation, and, not only so, but the imitation of the most grotesque and fantastical of human inventions. The caprice of man has certainly never wandered so far into the tasteless and extravagant, as in the department of the tailor and hair dresser. With all due respect even for these personages, as they existed and flourished in revolutionary times, we must boldly say, that there are few things more ungainly than the powder and pomatum, the ear-locks and clubbed hair, the coat and small-clothes of a continental major general of that period. If it were deemed desirable to perpetuate them, and if the imitation of nature were, without qualification, the principle of the art, it would be better, as they do in the wax-work museums, instead of torturing the marble, to put a *bona fide* peruke and a cloth uniform, faithfully fashioned after the model of 1776, upon the head and shoulders of the statue.

Mr. Chantrey, who belongs to what the English consider the school of historical imitation, in the matter of costume, has given Washington a drapery destitute of the only merit *such* drapery can have, that of resemblance to the costume of the time. Canova gave to Washington the Roman military costume, bearing no resemblance to the modern, covering the upper part of the person, but leaving a portion of the leg bare, conforming to ancient usage in military statues, but as unlike as possible to any dress actually worn in America and Europe in modern times. Mr. Greenough has adopted a drapery which meets all the requirements of deli-

cacy, which is sanctioned by the authority of the greatest masters of art in ancient and modern times, and to which the public is now reconciled and familiarized in busts, which are almost invariably made either wholly nude, or with an artistical drapery unlike any thing actually worn. This drapery in the statue of Washington gives the artist the opportunity of displaying the nervous arm, the broad shoulders, the full throat, the arching breast and swelling muscles of an heroic figure, in all their beautiful and manly proportions and symmetry. That some objections to this mode of representing Washington will be felt by those who have not reflected much on the subject, nor traced the necessary details and consequences of any other system, we the less doubt, as we have already heard them made, and have at a former period felt them ourselves. We have, however, a confidence, founded on experience, that the more the subject is weighed the more these objections will be found to loose their force; and we are strongly inclined to the opinion that the public taste will finally settle down in the conclusion that Mr. Greenough has, in this respect, adopted the plan most consistent with the dignity of the work to be performed, and most likely to afford a refined pleasure, independent of the caprices of fashion, in all future time; for the period can never arrive, so long as there is any taste or fondness for the beautiful creations of art, when the skilful delineation and idealization of "the human form divine" will not be considered one of the highest efforts of imitative skill.

The other point on which we presume Mr. Greenough's statue will be criticised, because we know it has been, regards the congruity of a sitting posture, with the action *supposed* to be indicated; that is, the resignation of Washington's command at the close of the war. We emphasize the word *supposed*, inasmuch as this idea, however current and even natural on a hasty inspection of this work, is wholly groundless. That a military officer would not perform the act of resigning his command in a sitting posture, is so exceedingly obvious that it could not have escaped an intelligent artist. Common politeness requires the performance of every such act in a standing posture. Again, in point of fact, Washington resigned not his sword, but his commission. It is not to be supposed that an artist undertaking to record a specific event, would have wandered so far from the well-known historical truth as to substitute a sword for a roll of parchment. The object of the work is misapprehended when it is supposed to record the performance of any specific deed. It is designed to represent a character, not an action. It is Washington in the aggregate of his qualities, not Washington performing a particular exploit, or discharging any particular function or duty. It is the Washington of a whole life, not of any one moment. It is expressive and suggestive, not historical and descriptive. With such a significance, a seated posture is not only appropriate, but it is preferable to a standing one. There are very few *actions* that can be performed by a public personage sitting in a chair. Canova has selected one of the few for his Washington, but the congruity of the action with the military harness in which it is performed is questionable. But this posture is most in keeping with the repose

and calmness personified in the character of Washington. The uplifted right hand, pointed to Heaven, does not perpetuate the memory of any gesture made by Washington, on any particular occasion; but it is in this way that the voiceless marble speaks out that habitual reliance on Providence which was so substantial an element of the character of the man. In like manner, the sword, in the other hand, is there, not as a weapon, but as a symbol. It indicates the military leader; but it is neither presented nor wielded. Washington is neither going to the field nor resigning, his command. He holds the sword which belongs to him as the commander-in-chief of the American armies. It is not taken in hand for use, although it is so held that it can be easily turned and grasped if occasion requires. It is not offered to be resigned, although it might, perhaps, without over-refinement, be inferred, from the peculiar manner in which it is held, that its owner is prepared and inclined to lay it down whenever it can be done with safety to the country. This explanation of the statue, it may be proper to say, is not given on the authority of Mr. Greenough. The writer of this article has never conferred with him on this point. It is the view of the matter which has spontaneously presented itself to his mind, for which the artist is in no degree responsible.

We will add but a single reflection on the subject, and it is this; that there is no one, in our judgement, however vivid his previous impressions, however exalted his conceptions of the character of Washington, that will not derive new views of its harmony, dignity, and elevation from the survey of this noble work.

DR. FRANKLIN'S OLD PRESS.

We are indebted to the kindness of Mr. J. B. Murray, of Liverpool, for a copy of the Liverpool Standard, containing the following account of Franklin's Printing Press. Mr. Murray has also sent us a copy of Dr. Franklin's Poem on Paper, printed at the identical press. It is a fine specimen of typography, and shows that the old machine is not yet superannuated by a great deal.

"The Franklin Printing Press.—The original printing press at which Dr. Franklin worked in London, as a journeyman printer, in the year 1725, '26, known as the 'Frankling Press,' arrived in this town a few days ago, prior to its departure for Philadelphia, where it will be placed in the Hall of the Philosophic Society, to which institution it is to be presented by Mr. John B. Murray, of New York. Mr. Murray has very considerably determined upon allowing this interesting memorial to remain in Liverpool till the end of the present week, and it may be viewed gratuitously at the Medical Institution, Mount Pleasant. The press is a strong, heavy and cumbersome piece of machinery, of ancient and primitive construction. In one of the beams is inserted a large brass plate, bearing the following inscription: 'Dr. Franklin's remarks relative to this press, made when he came to England as agent of Massachusetts, in the

year 1768. The Dr. at this time visited the printing office of Mr. Watt's, of Wild street, Lincoln's-inn-fields, and going up to this particular press (afterwards in possession of Messrs Cox & Son, of Great Queen street, of whom it was purchased) thus addressed the men who were working it—'Come my friends, we will drink together: it is now forty years since I worked like you as a journeyman printer.' The Dr. sent for a gallon of porter, and he drank with them 'success to printing.' From this time it will appear that it is 108 years since Dr. Franklin worked at this identical press.—June, 1833.' The Dr. it appears, has changed his tactics in the period that had elapsed since he was journeyman. In his days of adolescence we learn he used to take his penny loaf and his gill of water, inculcating on his fellow workmen the virtues of tetotalism, by preaching of the ill effects of porter, and endeavoring to convince his hearers that there was more nutriment in the bread and water, than in half a pint of malt liquor. As agent for Massachusetts, we find him sending for a whole gallon of porter. On another brass plate is the following:—'Presented by Messrs. Harrild & Sons, printers' brokers, London, to the Franklin Library, Philadelphia, through J. B. Murray, Esq., October, 1841.' This interesting relic has been visited by some of the most distinguished of our townsmen; among them, many gentlemen of the medical, clerical and legal professions, with a large number of ladies, all of whom have expressed their great gratification at seeing it. At the suggestion of the Rev. Dr. Raffles, the press is to be put in motion in order to show the manner in which its illustrious master formerly worked it, and Mr. Mitchell of the firm of Mitchell, Heaton & Mitchell, printers, will attend daily during the hours of exhibition, from 12 A. M. till 4 P. M., and on Saturday, until 9 P. M., to strike off copies of an extract from Dr. Franklin's life, which will be presented to visitors. The admission to see this 'antique,' although by ticket, is, as we have stated, entirely gratuitous. There is, however, a box placed near the press for the reception of contributions to the Printers' Pension Society, an institution well known to our readers as being every way charitable and highly deserving. We were yesterday favored with an impression of one of Dr. Franklin's poetical effusions, taken at this ancient press, and were surprised at the clean and perfect appearance it possesses."

IRON, LEAD AND COAL.

The amount of iron manufactured in the United States is estimated at \$29,265,000; of which Pennsylvania produces about one-fourth, principally wrought in the vicinity of Lancaster.

In 1839 there were received at St. Louis, Mo., 375,000 pigs of lead or 25,875,000 lbs.; in 1840, 352,000 pigs or 24,288,000 lbs., which estimated at 3½ cents per pound give for the whole a value of over two millions seven hundred thousand dollars, for less than three years. Most of this goes to New Orleans, and is thence exported to the north or elsewhere.

The different coal regions of Pennsylvania, have yielded this

season up to the close of navigation as follows : Schuylkill, 585,000, tons ; Lehigh, 135,000 ; Lackawana, 185,000 ; Pinegrove, 25,000 ; Shamokin, 20,000 ; total 925,000 tons, for one season in one coal producing State. These facts are but specimens, which illustrate the great mineral wealth of our country, and what immense resources yet lie hidden beneath our feet. There is hardly a region in the world, more rich in native ores, than the United States ; and if but half the labor and toil in digging for gold and silver had been expended in searching for the less dazzling, but more really valuable beds of iron, and lead, and coal, and marble, etc., etc., our internal resources would have been doubled, and our riches proportionably increased. It is from the teeming breasts of mother earth, that we derive our amplest wealth ; our greatest comforts, our very sustenance as a nation. These are treasures of which no one can despoil us, as they depend not on foreign markets, rely on no tariff for protection, for our home consumption is not yet supplied, and the demand, is yearly increasing. A pound of iron can be made a hundred times more valuable than a pound of gold. Gold has an intrinsic value, ever the same. Iron by manufacture can be changed in worth from one cent to thousands of dollars ; thus a pound of crude iron, costs one cent, and allowing one seventh for waste, contains 6000 grains. It is first made into steel, then into watch springs, each of which weighs only one tenth of a grain and sells for one and two dollars ; which, at the rate of \$60,000 to the 6000 grains, would afford a value of nearly \$150,000. We ask for no Potosi or Golconda, so long as we have the coal and iron formations of the Alleghany, and the lead mines of Missouri. These will be to us silver and gold, and precious stones.—*Savannah Georgian*.

NEW ERA IN LAKE NAVIGATION.—Under this head the St. Catharines Journal of November 25th, notices the arrival of a new steam and sail vessel, built at Oswego, for Messrs Bronson and Crocker, enterprising forwarders of that town. She is called the *Vandalia*, and is commanded by Captain Hawkins. Burthen 141 tons, sloop-rigged, with cabins on deck—one very neatly fitted up for passengers, the other for the crew. Her principal novelty is the Ericsson propeller, the machinery of which lies in a very small compass, and weighs only from four to five tons. The screws or paddles on each side of the rudder are about five feet in diameter, and act on the principle of sculling. When the vessel is laden, these act wholly under water. Engine about fifteen horse power. The Journal says the *Vandalia* left Oswego, in very unfavorable weather, with a cargo of 130 tons of merchandize, for Hamilton and Niagara. Notwithstanding the violent head winds and unusual roughness of the lake, she pursued her course in good style, between four and five miles per hour, which speed increased to seven and eight as the gale lessened and her canvass was brought into use. She steers delightfully—the movement of the screws assisting, rather than retarding, the operation of the rudder. This point was satisfactorily ascertained in the circuitous route of the canal, from Port Dalhousie to St. Catharines, where we had a full opportunity of testing the merits of this ingenious and novel invention. She glided along

without any perceptible motion of the water, so that not the least injury to the banks of the canal need be apprehended from the swell of water which arises from the paddles of an ordinary steamer. After passing one of the smallest locks on the canal, at this place, with ease, and staying an hour or two for the inspection of the inhabitants generally, she returned to Port Dalhousie on her route back to Oswego. We cordially wish her owners every success, and fully anticipate, now the experiment has been tried and so successfully answered their expectations, that next season we shall hail a large number of vessels constructed on the same principles.—*Cleveland Herald*.

FUNGUS VEGETATION IN WINE CELLARS.—A very remarkable kind of fungous vegetation is known to make its appearance in wine cellars, the substance which supplies the growth being the vapor from the wine in the casks or bottles. If the cellar be airy and dry, the vapor escapes, and no fungous vegetation is manifested; but if it be somewhat damp, and secluded from air and light, the fungous growth becomes at once apparent. Round every cork a mould-like vegetation will exhibit itself, and the vapor from the cask rising to the vaulted roof will there afford nourishment to great festoons and waving banners of fungi. In the wine vaults of the London docks, this kind of vinous fungi hangs like dark woolly clouds from the roof, completely shrouding the brick arches from observation. On a small piece being torn off and applied to the flame of a candle, it burns like a piece of tinder. Should wine escape from a cask in a moist and ill-ventilated cellar, it will altogether resolve itself into fungi of a substantial kind. A circumstance of this nature once came under the notice of Sir Joseph Banks. Having a cask of wine rather too sweet for immediate use, he ordered that it should be placed in a cellar to ripen. At the end of three years he directed his butler to ascertain the state of the wine; when, on attempting to open the cellar door he could not effect it, in consequence of some powerful obstacle. The door was therefore cut down, when the cellar was found to be completely filled with a firm fungous vegetable production, so substantial as to require an axe for its removal. This appeared to have grown from, or to have been nourished by, the decomposed particles of wine; the cask being empty, and buoyed up to the ceiling, where it was supported by the surface of the fungus.—*English Paper*.

CALCULATING MACHINE.—For the last two years Dr. Roth, of Paris, has been engaged in the construction of arithmetical machines, and the success that has attended his efforts hitherto proves he has accomplished his scheme for performing automatically all the operations of arithmetic, from simple addition, subtraction, multiplication and division to vulgar and decimal fractions, involution, arithmetical and geometrical progression, and the construction of logarithms, with ten plans of decimals. The machine in its present state works addition, subtraction, multiplication, and both kinds of progression quite mechanically. In division alone, the attention is required to avoid passing over the cipher. The arithmetical progression is of vast importance, as it operates from one farthing to

millions of pounds sterling. Mr. Wertheimber, the proprietor and patentee of this invention, has two descriptions of these machines—a larger one, which performs sums in addition, subtraction, multiplication, and division; and a smaller, which performs addition and subtraction only. These machines have been submitted to the inspection of several gentlemen eminent for their scientific attainments, of whom, particularly Mr. Babbage, have expressed the most unqualified admiration at their unparalleled ingenuity of construction. Mr. Wertheimber had the honor of an introduction to the royal presence, at Windsor Castle, on Wednesday, the 6th inst., when both Her Majesty and Prince Albert were graciously pleased to express their approbation of the machines, and to order two of each sort to be supplied for their use.—*London Times*.

STEAM SAFETY-VALVE.—The public will be happy to learn that there has at length been invented a means by which steam engines will be shorn of all their terror. We refer to an invention of Capt. Thomas S. Easton of New Orleans, and now in Mobile, of a valve which he calls the *Flue Safety-valve*. We cannot at this moment give a description of this wonderful but simple contrivance, farther than to say that it is applied to the flue inside the boiler; that it opens and causes the steam to escape into the flue, the moment that the water becomes as low as the flue, or the moment that an unsafe pressure of steam is generated; thus preventing both a collapse and the bursting of the shell. And we hesitate not to say, with our present impressions, and they are corroborated by the unqualified, nay, enthusiastic approbation of our most experienced and scientific engineers, that a flue cannot collapse if supplied with one of these valves. Repeated experiments have been made, and the promptness with which the required result is exhibited is most gratifying. In a few days we shall, with the approbation of the inventor, present our readers with a more particular description.—*Mobile Chronicle*.

RAILROADS AND AGRICULTURE.—We have noticed a little item in one of the northern papers, which conclusively shows the effect of railroads in developing the agricultural resources of the districts through which they pass. In a single day on that part of the New York and Erie railroad, which is completed between Goshen and Piermont, there were forwarded to New York 58,410 lbs. of butter; 30,312 lbs. of pork; 954 lbs. of beef; 5,359 lbs. of poultry; 1,015 lbs. nuts; 900 lbs. of live stock, besides 1,500 lbs. of sundries, in all nearly 100,000 lbs. of produce from one district in one day. What was formerly many leagues distant, requiring several days journey, at much expense of time and money, and great personal inconvenience, is now brought in direct neighborhood with a market, and can meet its demands and be in turn greatly enriched by its proximity.

So in time it will be with our railroad. Our farmers and planters have not yet learned to avail themselves, as they should, of the agricultural advantages which it offers, by which, though a hundred miles distant, they are, by this speedy communication, brought within a few hours of a market, which is the principal seaport of the State.
—*Savannah Georgian*.